OIPE

Docket No.: WLH-7945

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to the Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on the date indicated below.

By: _____ Date: March 2, 2004

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applic. No.	:	09/762,143	Confirmation No.:
Inventor	:	Leopold Hackl	
Filed	:	January 31, 2001	
Title	:	Method and Plant for Pyrolizing Hydrocarbon-Containing Waste Products	
TC/A.U.	:	5611	
Examiner	:	to be assigned	
Customer No.	:	24131	

Hon. Commissioner for Patents
Alexandria, VA 22313-1450

PETITION UNDER 37 C.F.R. §1.8(b)

Hon. Commissioner for Patents
Alexandria, VA 22313-1450

Sir:

The facts leading to this petition are as follows:

Applicants received a *Notice of Abandonment* dated February 24, 2004, in the above-identified application. According to the notice, a copy of which is enclosed herewith, applicants had allegedly not responded to the *Notice to file Missing Parts* mailed on March 14, 2001.

However, applicants did respond to the aforesaid notice by submitting the missing parts, namely the certified English translation along with the required fee and a cover letter, on April 3, 2001. The submission bore a mailing certificate under 37 CFR §1.8, which was properly executed on that date, and filed in the Patent Office on April 6, 2001.

Enclosed herewith, in accordance with Rule 8(b), is a copy of:

1. the postcard (front and back) confirming receipt in the PTO on April 6, 2001
2. the cover letter
3. the certified English translation
4. form PTO 2038
5. declaration by counsel who signed applicant's submission of April 3, 2001
6. declaration by counsel

In view of the foregoing, applicant respectfully requests that the Notice of Abandonment be rescinded and that the application be restored to pending status.

Respectfully submitted,

LAURENCE A. GREENBERG
REG. NO. 29,308

For Applicants

Date: March 2, 2004

Lerner and Greenberg, P.A.
Post Office Box 2480
Hollywood, FL 33022-2480
Tel: (954) 925-1100
Fax: (954) 925-1101
/bb

Docket No.: WLH-7945

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OFFICE OF PETITIONS

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applic. No.	:	09/762,143	Confirmation No.:	8412
Inventor	:	Leopold Hackl		
Filed	:	January 31, 2001		
TC/A.U.	:	5611		
Examiner	:	to be assigned		

DECLARATION

TO ACCOMPANY PETITION UNDER 37 C.F.R. §1.8(b)

I, (attorney's name), hereby declare that:

- I personally signed the mailing certificate
- I have reviewed the pertinent pages of the outgoing mail log for April 3, 2001, and the pages show that the enclosed papers were indeed mailed on that date.

GREGORY L. MAYBACK (Reg. No. 40,719)

Date: March 2, 2004

DOCKET NO. . .WLH-7945 . . . . . Mailed . .April. 3, . .2001. . . .

APPLIC. NO. . .09/762,143 . . . . . Express Mail . . . . . .

The stamp of the Patent Office hereon may be considered the date on which papers indicated below were received.

Applic pgs . . . . Rule 53b New ☐ Contin ☐ Div ☐ CIP ☐ / Rule 53c Prov. ☐ / Rule 53d CPA ☐

☐ CIP . . . pgs ☐ TM ☐ Design ☐ . . . Dwgs ☐ inf. ☐ fml. ☑ Mailing Certif.

☐ Priority Claim ☐ Cert. Prior. Doc(s) ☐ PCT Cover Sheet WO . . . . . .

☐ Amend pgs . . . ☐ Prel. Amend pgs . . . ☑ Letter

☐ Response pgs . . . ☐ 37CFR1.116 ☐ Not. of Appeal

☐ Brief pgs . . . ☐ Appndx pgs . . . ☐ I.D.S. + . . . Refs.

☑ Assoc Pwr of Atty ☐ . . . Specimen ☐ Declaration

☐ Pet. for Ext . . . . Mo. ☐ Pet . . . ☑ CHECK CARD $ 130

☐ Issue Fee ☐ Assignment ☑ PTO . . . NO. OF MISC. REQ

☐ St. of Use ☐ Cert. of Corr. ☐ File rec. copy

CERTIFIED ENGLISH TRANSLATION

(Patent Office. Please stamp and return to addressee on receipt.)

JC04 Rec'd PCT/PTO 06 APR 2001

OIPE JC191 APR 06 2001 PATENT & TRADEMARK OFFICE

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MAR 0 8 2004

OFFICE OF PETITIONS

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P.O. Box 2480
Hollywood, FL 33022-2480

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
09/762,143		Leopold Hackl	WBL-7945

CONFIRMATION NO. 8412

Lerner And Greenberg
PO Box 2480
Hollywood, FL 33020-2480

ABANDONMENT/TERMINATION LETTER

OC000000011955281

Date Mailed: 02/24/2004

NOTICE OF ABANDONMENT UNDER 37 CFR 1.53 (f) OR (g)

The above-identified application is abandoned for failure to timely or properly reply to the Notice to File Missing Parts (Notice) mailed on 03/14/2001.

- No reply was received.

A petition to the Commissioner under 37 CFR 1.137 may be filed requesting that the application be revived.

Under 37 CFR 1.137(a), a petition requesting the application be revived on the grounds of **UNAVOIDABLE DELAY** must be filed promptly after the applicant becomes aware of the abandonment and such petition must be accompanied by: (1) an adequate showing of the cause of unavoidable delay; (2) the required reply to the above-identified Notice; (3) the petition fee set forth in 37 CFR 1.17(l); and (4) a terminal disclaimer if required by 37 CFR 1.137(d).

Under 37 CFR 1.137(b), a petition requesting the application be revived on the grounds of **UNINTENTIONAL DELAY** must be filed promptly after applicant becomes aware of the abandonment and such petition must be accompanied by: (1) a statement that the entire delay was unintentional; (2) the required reply to the above-identified Notice; (3) the petition fee set forth in 37 CFR 1.17(m); and (4) a terminal disclaimer if required by 37 CFR 1.137(d).

Any questions concerning petitions to revive should be directed to the "Office of Petitions" at (703) 305-9282.Petitions should be mailed to: Mail Stop Petitions, Commissioner for Patents, P.O. Box 1450, Alexandria VA 22313-1450.

A copy of this notice MUST be returned with the reply.

Customer Service Center
Initial Patent Examination Division (703) 308-1202
PART 2 - COPY TO BE RETURNED WITH RESPONSE

Docket No.	Inventor	Express	POA	Pet. Ext.	Amend.	Amend 1.116	Response	Letter	Appeal Brief	Application	TM Applic	CIP	CPA	Divisional	Claim Priority	Priority Doc	IDS	Refs	Ltr D'man	Form Dwgs	Inf Dwgs	Issue Fee	Assign.	Fil.rec.corr.	PCT Sheet	Cert Corr.	Maint Fee	Check 1	Check 2	Decl.	1533	Add'l Information
Cont. of April 2, 2001																																
GR97P1907P	Tihanyi		X		5														X	1												
GR97P1136	Siedentop																															
GR97P8035	Sitting			2	7																											
USP99358	Lange		X														X	9									180				PTOL 1449, Europe
99P1624	Nissle		X														X	4													PTOL 1449
GR98P1627P	Hohmann		X														X	7													PTOL 1449, Exam Pre Ex
A-2405	Elmer		X														X	8													PTOL 1449
GR00P1031	Nie		X		10			X																						X	
GR97P3720P	Bittermann		X	1	10																						160				
A-2169	Guinsenna				10																											
A-2420	Koch		X		7																											
April 3, 2001																																
A-2336	Detmers	X								10										4							150					
A-2581	Beier	X								38					X	X				8							354					
GR97P6505	Packendorf														X	X						X	X				1240	40			85b, 15?5
US-010	Schaal																					X	X				1240	40			85b, 15?5
GR99P1269	Chrysostomides																					X	X				1240				85b
GR97P2543	Leibl																					X	X				1240	40			85b, 15?5
VBI-7933	Imbrigiotta																X	16													PTOL 1449, Prel. by applicant
GR98P8574	Mattlers		X												X	X																
IPN 97/642	Simonis							X															X				40				
GR97P8016	Hoss				X	X																					110				
WPA 31508	Bockmuss		X																	4											

Docket No.	Inventor	Express	POA	Pet. Ext.	Amend.	Amend 1.116	Response	Letter	Appeal	Brief	Application	TM Applic	CIP	CPA RCE	Divisional	Claim Priority	Priority Doc	IDS	Refs	Ltr D'man	Form Dwgs	Inf Dwgs	Issue Fee	Assign.	Fil.rec.corr.	PCT Sheet	Cert Corr.	Maint Fee	Check 1	Check 2	Decl.	1533	Add'l Information
Cont of April 3, 2001																																	
GR97P8045P	Hammer		X				1																										
HEM 98/604	Doherty							X													8												Offical Draftsman
GR98P1223	Zimmermann							X																									Statement by inventor
MUS-010	Schradi		X													X	X																
GR95P3461	Müller	X		1										X															820				
A-2545	Hieb		X					X																					130		X	X	PTOL 1533
GR96P1708	Schuh		X					X								X	X												130		X	X	PTOL 1533
TER-1054-8/23	Engbring		X					X									X												260		X		Cert. English Trans
GR98P1546	Beier		X	1				X								X	X												110	130	X	X	PTOL 1535
GR99P5358	Czech		X					X								X	X												110		X	X	Cert. of Inheritance
GR98P2370	Liobl		X					X																					130				
WLH-7945	Hackl		X					X																					130				Cert English Trans GB
Hp.N. 96/705	Offel				B																												
A-2251	Schönberger		X		R	X																							80				Drawing comments
April 4, 2001																																	
INF-523	Diehrich	X									21										2								710				
GR00P1668	Dahn	X									36							X	3		4								710				
GR00P1667	N. Kutta	X									23							X	2		4								710				
INF-11168	Hoingschmid	X									18										2								710				
GR96P1896	Troger	X														X	X												710				Omit Title Page
GR95P1058D2	Widmann	X									24				X			X			2								710				PTOL 1449
GR97P1626	Haas	X		2										X															990				

Docket No.: WLH-7945

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Assistant Commissioner for Patents, Washington, D.C. 20231.

By: _____ Date: April 3, 2001

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	:	Leopold Hackl
Appl. No.	:	09/762,143
PCT No.	:	PCT/IB99/01516
Filed	:	January 31, 2001
Title	:	Method and Plant for Pyrolizing Hydrocarbon-Containing Waste Products
Art Unit	:	5611

LETTER

Hon. Commissioner of Patents and Trademarks,
Washington, D.C. 20231

Sir:

The above-mentioned national stage application was filed on January 31, 2001 without a certified English translation.

In accordance with the above-mentioned rule, enclosed herewith is the original certified English translation as required by the Notification Of Missing Requirements dated March 14, 2001.

The fee required for the late filing of a certified English translation in the amount of $130.00 is also enclosed.

Please note that the correct attorney docket number is WLH-7945.

Respectfully submitted,

_____
GREGORY L. MAYBACK
REG. NO. 40,719

/mjb
Date: April 3, 2001
Lerner and Greenberg, P.A.
Post Office Box 2480
Hollywood, FL 33022-2480
Tel: (954) 925-1100
Fax: (954) 925-1101

Docket No.: WLH-7945

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	:	Leopold Hackl
Appl. No.	:	09/762,143
PCT No.	:	PCT/IB99/01516
Filed	:	January 31, 2001
Title	:	Method and Plant for Pyrolizing Hydrocarbon-Containing Waste Products
Art Unit	:	5611

ASSOCIATE POWER OF ATTORNEY

Hon. Commissioner of Patents and Trademarks,
Washington, D.C. 20231

S i r :

Please recognize GREGORY L. MAYBACK (Reg. No. 40,719) as my associate in the matter in the above-identified application, with full powers. Please continue addressing all communications to the following address:

Lerner and Greenberg, P.A.
P.O. Box 2480
Hollywood, Florida 33022-2480

Respectfully submitted,

LAURENCE A. GREENBERG
REG. NO. 29,308

For Applicant(s)

Date: April 3, 2001

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/mjb

09/762143

UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
Address: ASSISTANT COMMISSIONER FOR PATENTS
Box PCT
Washington, D.C. 20231

09/762,143 HECKL L WBL-7945

U.S. APPLICATION NO.		FIRST NAMED APPLICANT	ATTY. DOCKET NO.
		5611	PCT/IB99/01516

LERNER AND GREENBERG
PO BOX 2480
HOLLYWOOD FL 33020-2480

WHS

INTERNATIONAL APPLICATION NO.		
	08/02/99	07/31/98
	I.A. FILING DATE	PRIORITY DATE
		03/14/01

DATE MAILED: 14 MAR 2001

NOTIFICATION OF MISSING REQUIREMENTS UNDER 35 U.S.C. 371 IN THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US)

1. The following items have been submitted by the applicant or the IB to the United States Patent and Trademark Office as ☐ a Designated Office (37 CFR 1.494), ☑ an Elected Office (37 CFR 1.495):
   - ☑ U.S. Basic National Fee.
   - ☑ Copy of the international application in:
     - ☑ a non-English language.
     - ☐ English.
   - ☐ Translation of the international application into English.
   - ☑ Oath or Declaration of inventors(s) for DO/EO/US.
   - ☐ Copy of Article 19 amendments.
   - ☐ Translation of Article 19 amendments into English.
   - ☑ The International Preliminary Examination Report in English and its Annexes, if any.
   - ☐ Translation of Annexes to the International Preliminary Examination Report into English.
   - ☐ Preliminary amendment(s) filed _____ and _____.
   - ☑ Information Disclosure Statement(s) filed 3/13&/01 and _____.
   - ☐ Assignment document.
   - ☑ Power of Attorney and/or Change of Address.
   - ☐ Substitute specification filed _____.
   - ☑ Statement Claiming Small Entity Status.
   - ☐ Priority Document.
   - ☑ Copy of the International Search Report ☑ and copies of the references cited therein.
   - ☐ Other:

RECEIVED MAR

2. The following items MUST be furnished within the period set forth below in order to complete the requirements for acceptance under 35 U.S.C. 371:
   - ☑ a. Translation of the application into English. Note a processing fee will be required if submitted later than the appropriate 20 or 30 months from the priority date.
     - ☐ The current translation is defective for the reasons indicated on the attached Notice of Defective Translation.
   - ☐ b. Processing fee for providing the translation of the application and/or the Annexes later that the appropriate 20 or 30 months from the priority date (37 CFR 1.492(f)).
   - ☐ c. Oath or declaration of the inventors, in compliance with 37 CFR 1.497(a) and (b), identifying the application by the International application number and international filing date.
     - ☐ The current oath or declaration does not comply with 37 CFR 1.497(a) and (b) for the reasons indicated on the attached PCT/DO/EO/917.
   - ☐ d. Surcharge for providing the oath or declaration later that the appropriate 20 or 30 months from the priority date (37 CFR 1.492(e)).

3. Additional claim fees of $_____ as a ☐ large entity ☐ small entity, including any required multiple dependent claim fee, are required. Applicant must submit the additional claim fees or cancel the additional claims for which fees are due (37 CFR 1.492(g)). See attached PTO-875.

ALL OF THE ITEMS SET FORTH IN 2(a)-2(d) AND 3 ABOVE MUST BE SUBMITTED WITHIN ONE MONTH FROM THE DATE OF THIS NOTICE OR BY ☐ 21 OR ☑ 31 MONTHS FROM THE PRIORITY DATE FOR THE APPLICATION, WHICHEVER IS LATER. FAILURE TO PROPERLY RESPOND WILL RESULT IN ABANDONMENT.

The time period set above may be extended by filing a petition and fee for extension of time under the provisions of 37 CFR 1.136(a).

4. Translation of the Annexes MUST be submitted no later that the time period set above or the annexes will be cancelled. Note processing fee will be required if submitted later than 30 months from the priority date.

5. ☐ The Article 19 amendments are cancelled since a translation was not provided by the appropriate 20 (37 CFR 1.494(d)) or 30 (37 CFR 1.495(d)) months from the priority date.

Applicant is reminded that any communication to the United States Patent and Trademark Office must be mailed to the address given in the heading and include the U.S. application no. shown above. (37 CFR 1.5)

A copy of this notice MUST be returned with this response.

Enclosed: ☐ PCT/DO/EO/917 ☐ Notice of Defective Translation
☐ PTO-875

Lashanda Hunter
[illegible] National Stage Processing

FORM PCT/DO/EO/905 (December 1997)

Telephone: (703) [illegible]

Docket No.: WLH-7945

CERTIFICATION

I, the below named translator, hereby declare that: my name and post office address are as stated below; that I am knowledgeable in the English and German languages, and that I believe that the attached text is a true and complete translation of the application filed on January 31, 2001 under application number 09/762,143.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Hollywood, Florida

Christine Kahl

Christine Kahl

March 20, 2001

Lerner & Greenberg, P.A.
P.O. 2480
Hollywood, FL 33022-2480
Tel.: (954) 925-1100
Fax.: (954) 925-1101

DESCRIPTION

PROCESS AND PLANT FOR PYROLYZING HYDROCARBON-CONTAINING WASTE PRODUCTS

The invention relates to a process and a plant for pyrolyzing hydrocarbon-containing material, in particular used tires, thus ensuring economical and environmentally friendly utilization of organic waste materials, such as used tires, plastics, paper, biomass, such as agricultural and forestry waste materials.

A multiplicity of processes and devices or plants are known with which it is possible to treat reuseable materials, in particular fuels, by pyrolysis from waste materials. All these processes and plants have the common drawback that they are of extremely complex structure and in terms of operation and, moreover, can only be used for the same type of material.

For example, DE 26 58 371 C2, DE 35 45 954 A1 and DE 35 23 653 C2 have disclosed fluidized-bed reactors in which material in large pieces, for example used tires which have not been comminuted or have only been roughly comminuted, are introduced into the furnace from above and are pyrolyzed, while the gaseous substances are extracted at the top and the solids are discharged at the bottom. The structure of these devices is relatively complex and, because of the use of a sand and cement clinker bed, with fluidizing gas which is correspondingly introduced in the radial direction, it is often difficult to maintain the appropriate flow conditions in the fluidized bed and, on account of the mass of material introduced, can easily be moved away from the equilibrium. For smaller, flexible embodiments which can easily be converted to different pyrolysis materials, these plants cannot be used.

Furthermore, what are known as continuous pyrolysis furnaces or fluidized-bed furnaces in which the material to be pyrolyzed is pyrolyzed either in complete pieces or in comminuted form are described, for example in DE 44 47 357 A1, DE 29 25 202 A1, DT 25 20 754 A1 and DE 26 39 165 A1. These continuous pyrolysis furnaces are likewise of extremely complex structure are in each case designed for a specific type and/or size of material and cannot readily be converted for different types of material.

Pyrolysis plants which are used to pyrolyze comminuted used tires or other organic waste materials are also known, for example, from DE 27 24 813 A1, EP 0 477 187 B1 and DE 30 30 593 C2. These plants are in some cases of complex design and moreover cannot be used as an alternative, without special conversion work, both for whole used tires and for lumpy or bulk material.

Finally, DE 31 38 128 C2 has disclosed a process for the thermal conversion of used tires into liquid and gaseous substances, in which a rolling truck which is laden with complete used tires is introduced horizontally into a furnace, where the tires are treated with oil which has been heated to approximately 390° using the trickling technique.

Therefore, it is an object of the invention to provide a process and a plant of the abovementioned generic type which are easy to carry out or are of simple structure and which allow any desired rapid change with respect to the material which is to be pyrolyzed, for example complete used tires or organic waste bulk material, without special conversion of the furnace.

According to the invention, this object is achieved by a process of the generic type or a plant having the

features of claim 1 or claim 7, respectively. Advantageous refinements are in each case given in the subclaims which correspondingly refer back to these claims.

Accordingly, the material to be pyrolyzed is introduced vertically, from below, into a substantially bell-shaped pyrolysis furnace, which can be opened at the bottom, with the aid of a corresponding receiving device and is pyrolyzed at approximately 500°C, the volatile constituents (low-temperature carbonization gas) if appropriate being cleaned in a known way and being passed into a condenser. Depending on the way in which the process is carried out, different gaseous and liquid constituents are obtained, for example oil, which can be used, inter alia, as fuel oil. This fuel oil can be used to operate the burner of the pyrolysis furnace according to the invention, so that no additional energy is required from the outside for operation of the plant, or at least of the pyrolysis furnace. The solid residues which remain after the pyrolysis, such as steel-wire scrap and pyrolyzed carbon, after the end of pyrolysis are discharged from the furnace again vertically downward in or using the receiving device and are moved into an unloading station, where they are removed from the receiving device.

Depending on what type of hydrocarbon-containing material is to be pyrolyzed, for example uncomminuted used tires of various sizes, comminuted pieces of plastic or biowaste material, such as wood, straw, green plants, weeds, etc., according to the invention the materials can in principle be introduced into different receiving devices.

For example, used tires are introduced into receiving devices which have one, three or more vertically pointing receiving rods attached to a base plate, on

which rods the tires are stacked or arranged in rows vertically on top of one another. The receiving device to which car tires have been fitted in this way is attached to the top side of the furnace base which has been removed and is introduced vertically upward into the open furnace together with this base. The furnace base to which tires have been fitted in this way is then closed in a sealed manner by means of quick-acting closures, screw closures, or the like, in a manner which is known per se. However, the base plate of the receiving device may also, at the same time, be designed as the furnace base and can be directly introduced into the furnace without further interim assembly and attached to the furnace.

A particular advantage of the pyrolysis of used tires according to the invention is that after the pyrolysis has taken place and the receiving device has been transferred to a removal station, the residual materials can easily be separated from one another. For example, the receiving device is pivoted through at least 30° up to approximately 90° with respect to the vertical, with the result that the pyrolyzed carbon which is able to flow drops out of the receiving device, for example onto a conveyor belt, a process which can be accelerated or reinforced by at least gentle shaking. Steel-wire scrap remains in place, hanging as an annular mesh from the receiving rods in relatively clean form, and can be pulled off these rods and removed without problems. It can be pulled off by means of a dedicated combing device which, for example for each rod, presses the steel mesh situated thereon onto the base plate of the receiving device from above, possibly shaking it at the same time, after which this mesh, having been compressed in this way, is pulled off the rod, residual pieces of carbon crumbling away at the same time. In this way, clear, clean separation of the solid residues is achieved without major outlay.

In the case of pyrolysis of, for example, comminuted plastic or biomass material which is capable of forming a bulk bed, the receiving device comprises one or more receiving containers which can be stacked on top of one another and are filled to at most 90% of their height with material which is to be pyrolyzed. The at least 10% remaining clear height between the containers serves for the circulation of hot air, for which purpose in addition the side walls of the containers may additionally be provided with openings, forming perforated containers. It is expedient for at least the container bases to be left unperforated, in order to prevent the pyrolyzed carbon from trickling downward down to the base plate of the receiving device. Naturally, the container walls may consist of mesh material at least in their upper edge zones or other measures which are known per se may be taken in order to optimize circulation of hot gas. In any case, after pyrolysis is complete and after the container-receiving device has been removed from the furnace and introduced into the unloading station which, of course, may at the same time also be a loading station, the containers are to be appropriately removed from the receiving device and the solid pyrolysis residues are to be emptied out of the containers. The empty containers can then be stacked back into a receiving device. To avoid undesirable formation of carbon dust when shaking the pyrolysis soot out of the receiving devices or off the base plate or out of the containers, it is possible in a simple manner for the pyrolyzed carbon to be sucked directly out of the receiving devices, i.e. off the base plate of the device or out of the containers, and to be introduced into appropriate receiving or transport containers.

Furthermore, according to the invention it is advantageous if, when heating the pyrolysis furnace, for example by means of a gas or oil burner, the hot gases which are generated in the between the concentric

furnace walls of the double-walled furnace via a helically arranged hot-air duct [sic], the hot air is passed helically from the bottom upward and is then extracted at the upper end of the furnace, and the heat from the outgoing air is economically utilized in a known way. For example, this hot off-gas may, inter alia, be fed back to the furnace, specifically the lower zone thereof, or hot air from a heat exchanger can be introduced. In this way, even when the burner is temporarily switched off, for example while the furnace is open during introduction or removal of the receiving device together with material to be pyrolyzed, the furnace can be held at the optimum temperature, so that the furnace can very quickly be brought back to an optimum pyrolysis temperature of 450°-550°C. According to the invention, this allows the process to take place in a very energy-saving and economic manner.

It is advantageous if the helical transverse walls of the helical duct are in each case only welded onto the furnace inner wall while being connected to the outer wall in a thermally insulated manner. This avoids the formation of a temperature bridge via which valuable heat is dissipated to the outside instead of to the inside. Moreover, in a manner known per se the furnace walls are surrounded on the outside by a thermally insulated jacket. Also, in the vicinity of the burner the furnace walls are provided with fire clay, in order to protect them against the effects of excessive heat.

To achieve a particularly high level of thermal efficiency, heat-emitting plates which extend radially inward into the furnace interior are provided, which plates, as annular ribs, line the entire interior of the furnace. Furthermore, to facilitate work and at the same time to reinforce the ribs, at least three or more vertical introduction rails, which are uniformly spaced apart from one another, are arranged on the inside of the ribs. These rails interact with introduction rods

which are arranged on the receiving devices, likewise distributed uniformly over the circumference and in the same number.

According to the invention, the carbon obtained by the pyrolysis described above (pyrolyzed soot) can be utilized further in extremely valuable ways.

For example, the pyrolyzed carbon, in combination with small proportions of cement, can be used for construction materials which are highly thermally insulating, such as for example panels or tiles.

Pyrolyzed soot can also be used in combination with gypsum or refractory cement for fireproofing elements, for example for fireproof panels and fireguards or heat shields. For this purpose, by way of example three parts plastic or carbon are mixed with one part gypsum, naturally with the addition of water, and this mixture is processed to form a panel, for example. Tests have shown that a panel with a thickness of approximately 1.5 cm can be heated until it is glowing at the top and at the same time can be supported by hand from below without heat affecting the hand.

The use according to the invention as a fire-extinguishing means, for example for extinguishing burning oil, represents a particular use of the pyrolyzed carbon (soot). This is because if carbon dust is scattered on burning oil, firstly the supply of atmospheric oxygen to the layer of oil is suppressed and, in addition, the oil is sucked up by the carbon, which has a high suction capacity (adsorption), so that the fire is extinguished by the carbon, which itself no longer burns. In this way, a burning slick of oil or even burning oil in a pan in the kitchen can be extinguished very efficiently and relatively quickly.

Finally, according to the invention pyrolyzed carbon can be used to prevent or restrict the oil pollution which is known to have such a catastrophic effect after an oil tanker accident, for example. In this case, the ability of carbon to suck up large quantities of oil and at the same time not to be wetted by water is utilized, with the result that the carbon always floats on the surface of the water. For example, an oil slick which is spreading after a tanker accident is scattered with a suitable quantity of carbon, after which the carpet of carbon, which has sucked itself full of oil and is of considerably smaller area than the oil slick which was previously present, is scooped up. It can then be supplied for renewed pyrolysis, for example by the plant according to the invention, by which means oil and carbon are separated again.

According to the invention it is possible, as mentioned above, to produce high-quality plant oils, such as fir leaf oil or medical plant oils, which can be used in medicine and/or cosmetics.

It is also possible to pyrolyze animal corpses according to the invention, with the result that an oil and "animal charcoal" are likewise obtained. This eliminates the customary incineration of animal corpses.

The invention is explained in more detail below on the basis of an exemplary embodiment and with reference to the drawing, in which:

Fig. 1 shows a diagrammatic illustration, in vertical section, of a pyrolysis furnace according to the invention which is open at the bottom, without a bottom plate,

Fig. 2 shows a side view of a receiving device for pyrolyzing used tires, in an embodiment which

is fixedly connected to an exchangeable furnace bottom plate,

Fig. 3 shows a view in the direction of arrow III from Fig. 2, illustrating the arrangement of the used tires on the receiving device, and

Fig. 4 shows a side view of a receiving device with receiving containers for bulk material which is to be pyrolyzed, in a design for exchangeable attachment to a pyrolysis-furnace bottom plate.

As can be seen from the drawing, the plant according to the invention for the pyrolysis of hydrocarbon-containing material comprises a pyrolysis furnace 1. Its double-walled, substantially bell-shaped furnace wall 2 comprises an outer wall 3 with an inner wall 4 at a constant distance therefrom, between which walls there is arranged a transverse radial wall 5 which leads helically from the bottom upward and forms a helical duct 6, for guiding the hot air which is generated by a burner 7 helically from the bottom upward in the double wall. A slide valve 9, which is used to control the introduction of the hot air into the helical duct 6, is provided in the burner opening 8. At its upper side, the furnace wall is tapered in terms of diameter to form a dome, a few outlet pipes being arranged so as to lead away from this dome.

For example, an off-gas pipe 11 is provided leading away upward, via which pipe the hot air emanating from the burner 7, which has been conveyed upward via the helical duct 6, is dissipated through a stack or is passed to a heat exchanger or other user of hot air.

If necessary, this off-gas pipe 11 can be closed off by means of a valve 12. A pipeline 14, which can be controlled by means of a valve 13, leads radially away

from the interior of the dome 10 and serves to extract heat for a heat exchanger or for a heat accumulator, hot air emanating therefrom then being fed, for example via a supply pipe 16 provided with a valve 15 at the underside of the furnace, into the helical duct 6.

Moreover, a discharge pipe 20, by means of which the pyrolysis gases which collect in the dome are discharged, leads vertically out of the dome 10 substantially in the center. The discharge pipe comprises a short vertical pipe section 17, which merges into a pipe section 18 which is inclined downward slightly with respect to the horizontal and is of slightly larger cross section than the pipe section 17. A condensation-water line 19 leads away from the pipe section 18, a temperature-controlled electrovalve 21 being led either to the line 19 or to the pipe section 18 which carries gas and oil vapors. For its part, the pipe section 18 leads either via the oil line 22 into a cooling coil 23, which is passed through a cooling-water vessel 24 and opens into an oil collection vessel 25, from which the oil which has been collected can be discharged via an outlet pipe 26.

However, the pipe section 18 may also merge into a gas pipeline 27, which can be effected via a rotary switching part 28. Pyrolysis gas, which furthermore can also be passed as fuel gas to the burner 7, for example, is discharged into this gas pipeline 27, in particular when the pyrolysis process is managed for gas generation, e.g. for the generation of wood gas. It can be cooled in the same way or a similar way to the line 22, for example by means of cooling coil and cooling vessel. It should be noted that a substantially unpressurized, continuous gas circulation can take place, with no gas escaping to the outside.

With regard to the radial wall 5 which forms the helical duct 6, it should be noted that it is only

attached to the furnace inner wall 4 by welding or the like, while with regard to the outer wall 3 it is simply sealed in a thermally insulated manner, in order to avoid unnecessary dissipation of heat to the outside. Moreover, on the outside the furnace is provided with an insulating jacket 30, while ribs 31 which face radially inward are provided on the inner wall 4 and are used to improve the transfer of heat into the furnace interior 32.

At least three vertical introduction rails 33, which form an introduction slope 34 at their lower side, are attached, in a uniform circumferential distribution, to the inner side of the ribs 31. At the bottom, the furnace is closed off by a flange part 37, on which attachment elements 38 in the form of screws or the like, for a furnace base which is still to be described in connection with the further figures, are present.

As can be seen from Fig. 2, according to the invention a first receiving device 40 substantially comprises a base plate 41, to which a plurality of receiving rods 42 for receiving used tires 44 stacked vertically on top of one another are attached. In this embodiment, four receiving rods are provided. The way in which they are arranged on the base plate 41 depends on the size of the used tires and of the pyrolysis furnace or the base plate 41 of the receiving device 40.

Furthermore, introduction rods 43 are provided on the outer circumference of the base plate 41, which introduction rods interact with the introduction rails 33 of the pyrolysis furnace 1 when the receiving device 40 is being introduced into the pyrolysis furnace and help to prevent damage to the receiving device and/or the furnace inner lining. The base plate 41 is attached to a bottom plate 45 by means of screw attachment elements 46, and this bottom plate 45 for its part has a sealing attachment flange 47. When

the receiving device 40 has been introduced into and secured in the pyrolysis furnace 1, the attachment flange interacts with the flange part 37 of the pyrolysis furnace for providing a sealed attachment, after which, as a result of interaction of attachment eyelets 48 with the attachment elements 38 of the furnace, they secure the receiving device 40 above the bottom plate 45. On the underside of the bottom plate 45 there are stacking recesses 49, by means of which the receiving device 40 is handled. This means that the stacking recesses 49 are accessed by means of a fork-lift truck, the attachment elements 38, 48 are detached, the fork-lift truck which is carrying the receiving device 40 above its bottom plate 45 lowers it vertically until it has been moved all the way out of the furnace and then moves it into an unloading station, after which it brings a newly laden receiving device to the furnace and lifts or introduces it vertically into the furnace.

The receiving device 50 illustrated in Fig. 4 likewise has a base plate 41 on which screw attachment elements 46 serve for attachment to a bottom plate (not shown here) in a similar manner to that illustrated in Fig. 2. In this case too, introduction rods 43, which interact with the introduction rails 33 during introduction and removal, are provided on the base plate 41. Receiving containers 51 are stacked vertically on top of one another on the base plate 41, which containers are supported with respect to one another by means of stacking edges 53 which are provided in each case. Naturally, it is also possible to use a design in which an additional support for the receiving containers 51 is provided via the introduction rods 43. Bulk material 54 has been introduced into the receiving containers 51, specifically only sufficiently far for there to remain a distance 55 with respect to the upper edge of the container or the receiving container 51 stacked above

it, this distance being used for rapid, unimpeded heat exchange. In addition, perforations are provided in the vertical walls 52 of the receiving containers 51, provided that there is not a bulk material which could trickle laterally out of these holes in the wall.

LIST OF REFERENCE SYMBOLS

1	Pyrolysis furnace	29	
2	Furnace wall	30	Insulating jacket
3	Outer wall	31	Ribs
4	Inner wall	32	Furnace interior
5	Radial wall	33	Introduction rails
6	Helical duct	34	Introduction slope
7	Burner	35	
8	Burner duct	36	
9	Valve	37	Flange part
10	Dome	38	Attachment element
11	Off-gas pipe	39	
12	Valve	40	Receiving device
13	Valve pipe	41	Base plate
14	Pipeline	42	Receiving rod
15	Valve	43	Introduction rod
16	Supply pipe	44	Used tires
17	Pipe section	45	Bottom plate
18	Pipe section	46	Attachment element
19	Condensation-water line	47	Attachment flange
20	Discharge pipe	48	Attachment eyelet
21	Electrovalve	49	Stacking recess
22	Oil line	50	Receiving device
23	Cooling coil	51	Receiving container
24	Cooling-water vessel	52	Wall
25	Oil collection vessel	53	Stacking edges
26	Outlet pipe	54	Bulk material
27	Gas pipeline	55	Distance
28	Switching part		

PATENT CLAIMS

1. A process for pyrolyzing hydrocarbon-containing waste products, in particular used tires, in which
a) the material which is to be pyrolyzed is introduced into or onto a receiving device (40, 50) in a loading station outside the furnace (1),
b) the receiving device (40, 50) is then introduced from below into a pyrolysis furnace which is open at the bottom, at the same time tightly closing the furnace (1),
c) after which the furnace (1), by means of burners (7), is heated to the pyrolysis temperature of approximately 500°C and the pyrolysis is carried out,
d) then, after pyrolysis has concluded, the receiving device (40, 50) is removed downward and is moved into an unloading station, where the residues are discharged,
e) and another receiving device which is laden with material to be pyrolyzed is moved out of the loading station to the furnace and is inserted into the latter.

2. The process as claimed in claim 1, characterized in that for the purpose of keeping the furnace (1) warm on an interim basis while it is being loaded and unloaded from below, the furnace is kept warm with the aid of its own outgoing hot air or heat-exchanger air.

3. The process as claimed in claim 1, characterized in that during the pyrolysis of used tires (44), the tires are stacked in rows on top of one another on at least one vertical, upwardly facing receiving rod (42) (spacer rods) of the receiving device (40).

4. The process as claimed in claim 1, characterized in that during the pyrolysis of agricultural and forestry products or bulk material (54), the latter are introduced into receiving containers (51) which can be stacked vertically on top of one another and are easy to remove.

5. The process as claimed in claim 3, characterized in that the receiving device (40, 42), in the unloading station, is tilted through 30° to 90° with respect to the vertical and is shaken, for the purpose of removing the solid pyrolysis residues which are capable of flowing, after which the metal constituents which have remained attached to the receiving rods (42) are pulled off these rods.

6. The process as claimed in claim 4, characterized in that in the unloading station the receiving containers (50, 51) are removed from the receiving device (56) in the vertical direction and the solid pyrolysis residues situated therein are discharged by suitable tilting and shaking or suction, after which they are loaded again and are inserted into a receiving device (50) again.

7. A plant for carrying out the process as claimed in claims 1 to 6, comprising
- a pyrolysis furnace (1), which is an externally heated double-walled furnace with helical transverse walls (5) which lead from the bottom upward and form a helical channel (6) for the hot air,
- the furnace having a vertically lowerable base (45) and being designed so that it can be loaded and unloaded vertically from below via this base.

8. The plant as claimed in claim 7, characterized in that at least one material-receiving device

(40, 50) is provided, which can be attached to the top side of the vertically moveable base (45) or is part of the base, therefore at the same time is the closure bottom plate (45) of the furnace (1).

9. The plant as claimed in claim 8, characterized in that for a furnace a plurality of furnace bases (45, 47), each with a receiving device for the material to be pyrolyzed arranged fixedly thereon are provided.

10. The plant as claimed in claim 8, characterized in that only one furnace base (45, 47) and a plurality of separate receiving devices (40, 50) which interact with this base are provided, which receiving devices are designed so that they could be rapidly attached to the bottom plate (45) of the furnace base by means of screws.

11. The plant as claimed in claim 8, characterized in that for the pyrolysis of used tires (44), the receiving device (40) has receiving rods (42), which are attached to a bottom plate (41) and project vertically, for stacking rows of the tires (44) on top of one another.

12. The plant as claimed in claim 11, characterized in that for the pyrolysis of comminutable material which is capable of forming a bulk material, at least one stackable receiving container (41) with lateral wall openings is provided as a perforated-plate container.

13. The plant as claimed in claim 7, characterized in that for reliable introduction of the receiving devices (40, 50), at least three introduction rods (43) which are arranged vertically close to the outer circumference on the base plate (41) thereof are provided on the receiving rods, while vertical

introduction rails (33), which are arranged at a radial distance from the furnace inner wall (4) and have opening-side introduction slopes (34), are arranged in the pyrolysis furnace (1).

14. The plant as claimed in claim 7, characterized in that the pyrolysis double-walled furnace (1) can be heated from the outside by electrical means or by means of oil or gas burners (6), and in that the cylindrical furnace inner wall (4) is equipped with heat-emitting plates or radiation ribs (31) which face radially inward and extend as far as the introduction rails (33).

15. The plant as claimed in claim 7, characterized in that the upper hot-air or off-gas pipe (11) and/or the line from a heat exchanger to an introduction connection piece or supply pipe (16) is guided at the bottom end of the furnace (1).

16. The plant as claimed in claim 7, characterized in that the helical transverse walls (5) of the helical duct (6) are only welded onto the furnace inner wall (4), while they are connected to the furnace outer wall (3) in a thermally insulated manner, and in that the furnace walls (3, 4) in the vicinity of the burner (7) are designed with fire clay, and the furnace overall has a thermally insulating jacket (30) on the outside.

17. The use of pyrolyzed carbon produced using the process and plant as claimed in the preceding claims, in combination with a small proportion of cement, for construction materials with high thermal insulation properties.

18. The use of pyrolyzed carbon in combination with gypsum or refractory cement for fireproofing

elements, such as fireproof panels, fireguards or heat shields.

19. The use of pyrolyzed carbon as claimed in claim 18, characterized in that a mixing ratio of three parts carbon to one part gypsum is used.

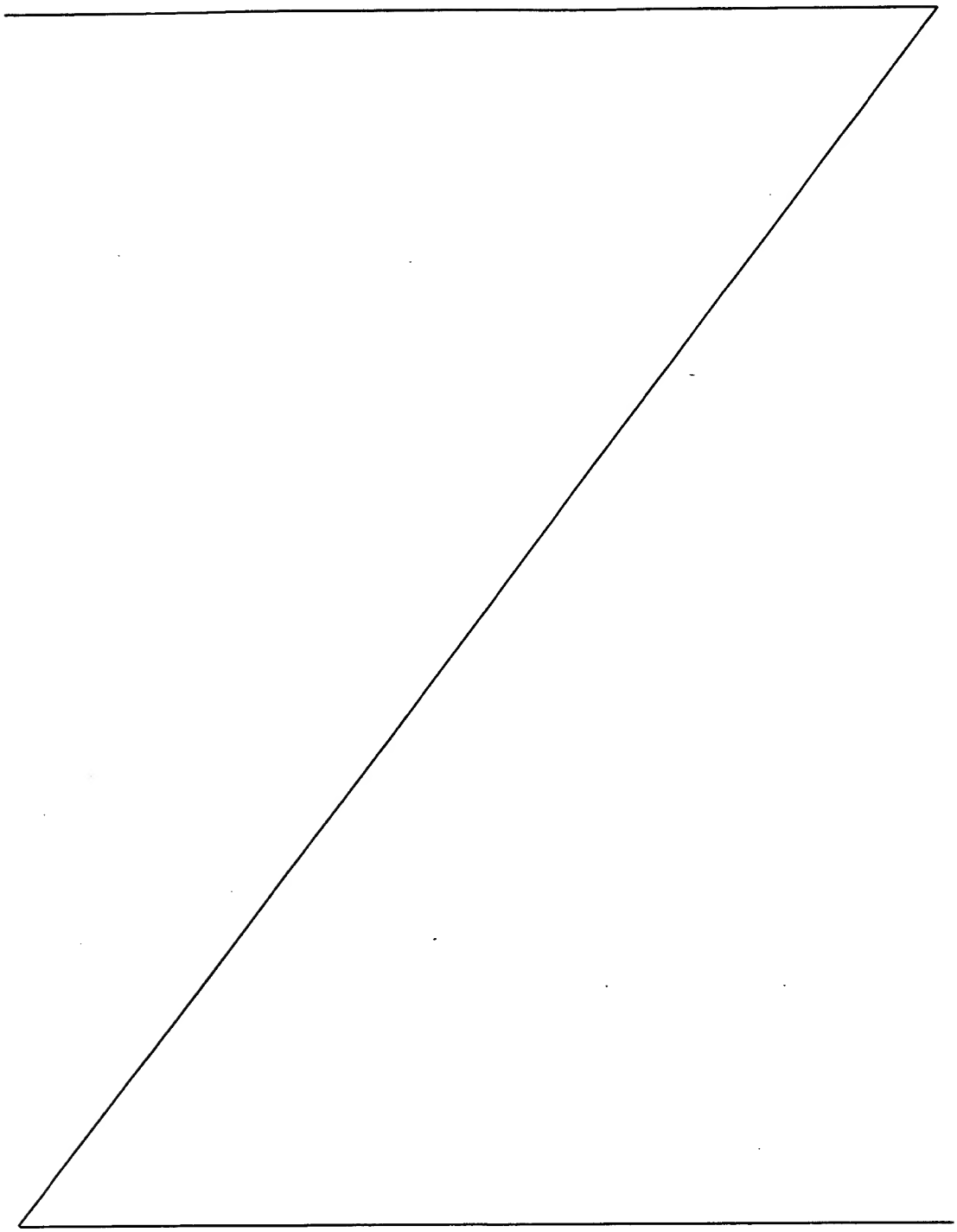
20. The use of pyrolyzed carbon as a fire-extinguishing means, for example for extinguishing burning oil, large fires, forest and bush fires, and fires on water.

21. The use of pyrolyzed carbon for preventing oil pollution in particular after an oil tanker accident, carbon being scattered on the slick of oil and the carpet of carbon which has sucked itself full of oil, floats on top of the water and is of considerably reduced area is scooped out and the separation into oil and carbon is carried out again by subsequent pyrolysis.

ABSTRACT

The invention describes a process and a plant for pyrolyzing hydrocarbon-containing waste products, in particular used tires or biowaste, in which the material to be pyrolyzed is introduced into a pyrolysis furnace and is pyrolyzed at 500°C. The significant factor is that the material is introduced as far as possible without being broken down, into a receiving device outside the furnace (1), which receiving device is introduced into the pyrolysis furnace, which is open at the bottom, from below, the device simultaneously closing the furnace (1) in a sealed manner. The significant advantage is that a plurality of different receiving devices for different materials can be provided, so that the pyrolysis plant can be used with a relatively quick changeover for different pyrolysis raw materials, without changeover measures on the furnace being required.

Fig. 1



it is often difficult to maintain the appropriate flow conditions in the fluidized bed and, on account of the mass of material introduced, can easily be moved away from the equilibrium. For smaller, flexible embodiments which can easily be converted to different pyrolysis materials, these plants cannot be used.

Furthermore, what are known as continuous pyrolysis furnaces or fluidized-bed furnaces in which the material to be pyrolyzed is pyrolyzed either in complete pieces or in comminuted form are described, for example in DE 44 47 357 A1, DE 29 25 202 A1, DT 25 20 754 A1 and DE 26 39 165 A1. These continuous pyrolysis furnaces are likewise of extremely complex structure are in each case designed for a specific type and/or size of material and cannot readily be converted for different types of material.

Pyrolysis plants which are used to pyrolyze comminuted used tires or other organic waste materials are also known, for example, from DE 27 24 813 A1, EP 0 477 187 B1 and DE 30 30 593 C2. These plants are in some cases of complex design and moreover cannot be used as an alternative, without special conversion work, both for whole used tires and for lumpy or bulk material.

Moreover, DE 31 38 128 C2 has disclosed a process for the thermal conversion of used tires into liquid and gaseous substances, in which a rolling truck which is laden with complete used tires is introduced horizontally into a furnace, where the tires are treated with oil which has been heated to approximately 390° using the trickling technique.

FR 640 770 A has disclosed a plant for the distillation of carbon-containing material which comprises a plurality of furnaces which are arranged in series and the respective bottoms of which can be removed in the downward direction. These bottoms are attached to vertical lifting devices, at the retracted, i.e. lower position of which in each case one receiving container holding material to be treated can be fitted or removed and conveyed onward to the next furnace. The heat treatment takes place by pressing treatment fluid, such as superheated steam, into the respective furnace from

above, which fluid is discharged at the underside of the furnace in question, the distillation products which are contained in the steam in each case being removed by means of a "degreaser", after which the fluid which has been cleaned in this way is fed back to the furnace in front under pressure from above. Therefore, the material to be treated and the treatment fluid pass in countercurrent from furnace to furnace, in each case with corresponding degreasing stations, resulting in an extremely complex structure which requires large amounts of space and is therefore relatively uneconomical.

DE 37 41 110 A1 describes a cylindrical rotary pyrolysis furnace, through the interior of which biological slurry is continuously passed, while hot gas is passed in the opposite direction inside a cavity which concentrically surrounds the rotary furnace on the outside. This device does not allow a rapid, problem-free changeover of material which is to be pyrolyzed.

Moreover, US 5,783,046 A has disclosed a device for the distillation or pyrolysis of rubber or used tires, in which the material is treated in two furnaces in succession, heating taking place in the first furnace and the final distillation or pyrolysis taking place in the second furnace. In this arrangement, used tires are bundled securely, in axial rows, into the horizontally fed furnaces. In this case too, the structure of the known device is highly complex and therefore uneconomical.

US 1, 586,306 A describes a tunnel furnace in which the comminuted material which is to be distilled is passed through the furnace on shelf trucks and passes through zones of different temperatures. This too is a relatively complex, uneconomic treatment of the material.

Finally, DE 43 03 842 A1 describes a process for eliminating environmental pollutants by adsorption with the aid of ground coal and coal products, which are scattered onto environmental pollutants, for example over oil which is on the surface of water. The coal product, which sucks itself full of oil, is then exposed to microorganisms and is left to ferment therewith, either remaining on the water surface in this way or being added to soils which can be plowed or to ground deposits. As a result, both relatively valuable products, namely the coal adsorbent and the oil, are lost. There is no provision for the oil to be recovered.

Therefore, it is an object of the invention to provide a process and a

PATENT CLAIMS

1. A process for pyrolyzing hydrocarbon-containing waste products, in particular used tires, in which

a) only one pyrolysis furnace (1) is provided, the material which is to be pyrolyzed being introduced into or onto a receiving device (40, 50) in a loading station outside the furnace (1),

b) the receiving device (40, 50) is then introduced from below into a pyrolysis furnace which is open at the bottom, at the same time tightly closing the furnace (1),

c) after which the furnace (1), by means of burners (7), is externally heated to the pyrolysis temperature of approximately 500°C and the pyrolysis is carried out completely,

the hot air being passed helically from the bottom upward in the pyrolysis furnace (1), which is designed as a double-walled furnace with a helically arranged hot-air helical duct (6), and being extracted at the upper end of the furnace,

and the pyrolysis gases being discharged via a discharge pipe (20) which leads vertically out of the furnace dome (10) provided at the top side,

d) then, after pyrolysis has concluded completely, the receiving device (40, 50) is removed downward and is moved into an unloading station, where the residues are discharged,

e) and another receiving device which is laden with material to be pyrolyzed is moved out of the loading station to the furnace and is inserted into the latter.

2. The process as claimed in claim 1, characterized in that for the purpose of keeping the furnace (1) warm on an interim basis while it is being loaded and unloaded from below, the furnace is kept warm with the aid of its own outgoing hot air or heat-exchanger air.

3. The process as claimed in claim 1, characterized in that during the pyrolysis of used tires (44), the tires are stacked in rows on top of one another on at least one vertical, upwardly facing receiving rod (42) (spacer rods) of the receiving device (40).

4. The process as claimed in claim 1, characterized in that during the pyrolysis of agricultural and forestry products or bulk material (54), the latter are introduced

and has helical transverse walls (5) which lead from the bottom upward and form a helical duct (6) for the hot air, which is passed helically from the bottom upward and is extracted at the upper end of the furnace, and which for discharging the pyrolysis gases has a discharge pipe (20) which leads vertically out of the furnace dome (10) provided at the top side of the furnace,

- the furnace having a vertically lowerable base (45) and being designed so that it can be loaded and unloaded vertically from below via this base,
- and the cylindrical furnace inner wall (4) being equipped with heat-emitting plates or radiation ribs (31) which face radially inward.

8. The plant as claimed in claim 7, characterized in that at least one material-receiving device (40, 50) is provided, which can be attached to the top side of the vertically moveable base (45) or is part of the base, therefore at the same time is the closure bottom plate (45) of the furnace (1).

9. The plant as claimed in claim 8, characterized in that for a furnace a plurality of furnace bases (45, 47), each

into receiving containers (51) which can be stacked vertically on top of one another and are easy to remove.

5. The process as claimed in claim 3, characterized in that the receiving device (40, 42), in the unloading station, is tilted through 30° to 90° with respect to the vertical and is shaken, for the purpose of removing the solid pyrolysis residues which are capable of flowing, after which the metal constituents which have remained attached to the receiving rods (42) are pulled off these rods.

6. The process as claimed in claim 4, characterized in that in the unloading station the receiving containers (50, 51) are removed from the receiving device (56) in the vertical direction and the solid pyrolysis residues situated therein are discharged by suitable tilting and shaking or suction, after which they are loaded again and are inserted into a receiving device (50) again.

7. A plant for carrying out the process as claimed in claims 1 to 6, comprising

- only one pyrolysis furnace (1), which is a double-walled furnace which can be heated from the outside by electrical means or by means of an oil or gas burner (7)

with a receiving device for the material to be pyrolyzed arranged fixedly thereon are provided.

10. The plant as claimed in claim 8, characterized in that only one furnace base (45, 47) and a plurality of separate receiving devices (40, 50) which interact with this base are provided, which receiving devices are designed so that they could be rapidly attached to the bottom plate (45) of the furnace base by means of screws.

11. The plant as claimed in claim 8, characterized in that for the pyrolysis of used tires (44), the receiving device (40) has receiving rods (42), which are attached to a bottom plate (41) and project vertically, for stacking rows of the tires (44) on top of one another.

12. The plant as claimed in claim 11, characterized in that for the pyrolysis of comminutable material which is capable of forming a bulk material, at least one stackable receiving container (41) with lateral wall openings is provided as a perforated-plate container.

13. The plant as claimed in claim 7, characterized in that for reliable introduction of the receiving devices (40,

50), at least three introduction rods (43) which are arranged vertically close to the outer circumference on the base plate (41) thereof are provided on the receiving rods, while vertical introduction rails (33), which are arranged at a radial distance from the furnace inner wall (4) and have opening-side introduction slopes (34), are arranged in the pyrolysis furnace (1).

14. The plant as claimed in claim 7, characterized in that the upper hot-air or off-gas pipe (11) and/or the line from a heat exchanger to an introduction connection piece or supply pipe (16) is guided at the bottom end of the furnace (1).

15. The plant as claimed in claim 7, characterized in that the helical transverse walls (5) of the helical duct (6) are only welded onto the furnace inner wall (4), while they are connected to the furnace outer wall (3) in a thermally insulated manner, and in that the furnace walls (3, 4) in the vicinity of the burner (7) are designed with fire clay, and the furnace overall has a thermally insulating jacket (30) on the outside.

16. The use of pyrolyzed carbon as a fire-extinguishing means, for example for extinguishing burning oil, large fires, forest and bush fires, and fires on water.

17. The use of pyrolyzed carbon for preventing oil pollution in particular after an oil tanker accident, carbon being scattered on the slick of oil and the carpet of carbon which has sucked itself full of oil, floats on top of the water and is of considerably reduced area is scooped out and the separation into oil and carbon is carried out again by subsequent pyrolysis.